

milk, mortar, nickel, photography, analysis (qualitative and quantitative), nitric acid, nitrates, salts, oxygen, gunpowder, sulphur, sulphuric acid, silver, specific gravity, thermometer, porcelain, hyposulphites, water, wine, tartrates, tungstates, sugar, &c. The following subjects are treated of in some detail:—Alcoholometry, aniline dyes, areometer, iron, carbonates, light, mineral waters, common salt, sulphates, heat.

The value of the dictionary as a work of reference is decidedly enhanced by the adoption of thick type for the words heading the articles. In the case of recently discovered compounds we are of opinion that a short bibliographical reference to the paper wherein such compounds are first made known would have greatly increased the value of the articles without materially adding to their length. The author has fallen into an error in treating of thermo- and pyro-electricity under the same heading; the former term is employed by electricians in this country to denote the electricity developed by heat in *conductors*, the latter to denote the electricity produced by heat in *non-conductors*.

Bearing in mind the enormous range of subjects now embraced by the science of chemistry, for a volume of the present size the amount of information conveyed is really very great. With the exception above pointed out, the articles, though necessarily brief, are to be depended on for accuracy, and we can safely recommend Dr. Dammer's dictionary as a useful work of reference.

R. M.

Clouds in the East. Travels and Adventures on the Perso-Turkoman Frontier. By Valentine Baker. With Maps and Illustrations. (London: Chatto and Windus, 1876.)

THE author of this interesting volume had special facilities for visiting the Russian outposts in Asia and the Persian frontier; he had powerful recommendations to the highest Russian and Persian authorities. By various causes, however, he was prevented from taking complete advantage of these, so that the main part of his work describes his journeys in the district to the south of the Caspian, and from Teheran towards the north-east Persian frontier. He reached the Caspian by Trebizond and Tiflis, and gives some interesting particulars as to navigation on the inland sea. He was able to visit the mouth of the much-talked-of Atrek, and found that the Gurgan, to the south of the Atrek, is the real Russian frontier in this region. He was unfortunately prevented from visiting Merv and Herat, which he had intended to do. Mr. Baker's main objects were sport and to ascertain the real nature of the advances made by Russia in Central Asia. Of the former he got a fair amount around Teheran, and his work will be of very considerable importance to those who are interested in the movements of Russia. He took considerable pains to ascertain Persian feeling on the question; Persia cannot understand, or rather misunderstands, England's inaction. Mr. Baker gives many valuable notes as to the nature of the country passed over, its productions, antiquities, and inhabitants. Concerning the Turkomans especially, and their wonderful houses, many details will be found. Altogether the work is an intelligent and interesting narrative of travel in an important region, and a substantial contribution to the Asian question. There are three good maps, but the chromolithographs are very poor specimens of their kind.

LETTERS TO THE EDITOR

The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

The Use of the Words "Weight" and "Mass"

I WILL supplement Mr. Bottomley's authorities for the meaning of *gravity* by others which will be perhaps considered

more relevant. Maupertuis, "Figure de la Terre," Paris, 1738, writes:—"Il faut bien distinguer ici la pesanteur d'un corps d'avec son poids . . . La pesanteur dans un grand corps, n'est pas plus grande que dans un petit. Il n'en est pas ainsi du poids; il dépend non-seulement de la pesanteur, mais encore de la masse des corps . . . il est le produit de la pesanteur par la masse" (p. 155). Subsequently, he lays down the distinction between pesanteur and gravité which Clairaut adopted; but universally the English *gravity* has been used as synonymous with the French *pesanteur*. Airy, "Gravitation," p. 3: "To take the ordinary force of gravity for an instance, we might measure it by the pressure which is produced on the hand . . . or by the number of inches through which the lump of lead would fall in a second of time . . . But there is this difference between the two measures; if we adopted the first . . . we should find a different measure by the use of every different piece of lead; whereas if we adopt the second . . . we shall get the same measure for gravity whatever body we suppose subject to its influence." Here the broad distinction between "weight" and "gravity" is clearly laid down; the one is the "impressed force" on the falling body, the other its "accelerative effect" (Thomson and Tait, "Treatise on Nat. Phil.," 217-219), or the more familiar "moving force" and "accelerating force." In the "Treatise" the former is called the "force of gravity on the mass of a body," 220; but "gravity" alone seems clearly enough defined as acceleration, by the words "According to this formula, therefore, polar gravity will be

$$g = 32.088 \times 1.005133 = 32.2527.$$

Again, § 226: "The augmentation of gravity per degree . . . is, at most . . . The average . . . differs certainly, but little from 32.2."

I think it evident that *gravity* has not been "lying ready for use, but left almost idle," as Mr. Bottomley supposes.

To the restriction on the use of weight—which I feebly support, but which is certainly not mine—I do not conceive that the "Act of Parliament" offers any bar; as the weights of masses are merely thereby defined in terms of the weight of the standard mass. This restricted sense is clearly recognised in such passages as the following, from Thomson and Tait's "Elements," § 366, "The measurement of force whether in terms of the weight of a stated mass in a stated locality . . ."

As to the compounds "centives," &c., I advisedly adopted the Latin prefixes in their old etymological sense, so as to have wholly Latin names and thereby prevent any confusion with the C. G. S. kinetic measures. The employment in the metric system being quite conventional and contrary to analogy, I feel justified in following older precedents.

J. J. WALKER

"The Recent Origin of Man"

IN NATURE, vol. xiii. p. 245, a writer over the initials "W. B. D." reviews in no very complimentary terms my book entitled "The Recent Origin of Man." I am charged with inconsistency, inaccuracy, incompetency, &c. When charges of this sort are made they ought not to be made lightly, and the writer making them ought to weigh his statements.

My space is necessarily brief, but I beg permission to comment on a few of the assertions made by "W. B. D." in rendering his judgment on the premises.

1. He remarks: "The statement that no traces of a rude and imperfect civilisation have been met with in the East is refuted by the discovery of enormous quantities of flint implements in Egypt and of neolithic axes in Asia Minor and in India. In the river gravels of both these regions paleolithic hâches have been found of the same type as those of Amiens and Abbeville."

We all know that paleolithic implements have been found in the river-gravels of India; I refer to this on p. 31 of my book; but I am not aware that paleolithic implements have been found in the river-gravels of Egypt or Asia Minor. As "W. B. D." asserts it, I beg leave to ask for the particulars.

As for the occurrence of flint implements in Egypt, I remark on p. 478: "Flint implements have been found in Egypt but they belong to the Neolithic age, and occur on the surface, or near the surface, or in the tombs." I mention that one implement of paleolithic type had been found. I show that flint arrow heads and flint knives have been frequently found in the Egyptian tombs by the side of the mummies.

That Sir John Lubbock found in the Nile valley a few implements resembling the paleolithic types I am aware; but implements of paleolithic type were found at Cissbury by Col. A.

Lane-Fox. *No flint implements have been found in Egypt in association with an extinct fauna, or in beds corresponding in geological position to the implement-bearing gravels of the Somme valley.*

2. "W. B. D." asserts that in every one of the cases cited by me (I cite one or two hundred) to prove "the ages" simultaneous, "there is no proof that the deposit has not been disturbed."

I select by way of reply five examples: the pile-village at Unter Uhldingen (Switzerland); the skeletons found at Cumarola, in Italy; the trenches at Alise; the pile-village near Lubtow, in Pomerania; and the relic-beds at Hissarlik.

3. Solutré is a crucial case. Referring to this, "W. B. D." disposes of it by remarking that a Merovingian cemetery was planted here on a palaeolithic station, "as he was informed by Dr. Broca at the French Association at Lyons in 1873." "In this case," he proceeds, "which is made the basis of the attack on the high antiquity of palaeolithic men, the human skulls are comparatively modern, and the refuse heap of an untold age."

This statement implies both ignorance and a treacherous memory on the part of "W. B. D."

We are all aware that there are Merovingian remains at Solutré. There are also Roman or Gallo-Roman remains. But the argument from Solutré is this: (1) That the bones of the extinct animals found in association with the flint implements have preserved a portion of their gelatine, and that the horns of the reindeer, when cut, yield the odour of fresh horn. (2) That the flint implements found, though unpolished, are of very superior and advanced workmanship, hardly inferior to the beautiful specimens from Denmark. (3) That there are found here the remains of some 40,000 horses, and that the horse was probably domesticated. (4) That there are numerous instruments here of palaeolithic date, some of them in carefully closed stone cists or boxes. The remark of "W. B. D." about the Merovingian graves has therefore no application except in connection with (3) and (4); as regards (3), the *horse-deposit*, as it is called (outside of the refuse-heaps), some of which was compacted into a solidified mass—contained the flint implements and the bones of the mammoth, reindeer, &c.; and, in addition, *extended beneath* the most ancient fire-places, or hearths, containing the palaeolithic skeletons and the flints and the bones of the reindeer and mammoth. The horse-remains are not, therefore, Merovingian. As regards (4), and the assertion, on the authority of Dr. Broca, that the graves are Merovingian; this whole subject came up at the French Association at Lyons in 1873; the Association *visited* Solutré; and by way of reply to what "W. B. D." says he gathered from Dr. Broca, I quote from the report of the Proceedings of the Association in "Méthodes pour l'Histoire de l'Homme," 7^e, 8^e, and 9^e Livraisons, 1873, pp. 324, 325, 342. When M. Cartailhac observed that "the discussion was of the greatest gravity, and would remain celebrated in the history of anthropological science," and that although there may have been some disturbances of the soil, "one thing remained certain, viz., that in more than ten instances, a human skeleton had been found on a quaternary fire-place, and not one fact exists to be opposed to the admission of their contemporaneity"—when M. Cartailhac had expressed himself to this effect, the report proceeds:—

"M. Broca partage cette opinion et déclare ouverte la discussion sur le deuxième problème: *les chevaux.*"

Subsequently, participating further in the discussion (p. 342), M. Broca stated that he had examined twenty-five skulls from Solutré, and that of this number seventeen belonged to the epoch of the reindeer—"à la véritable époque paléolithique solutréenne."

I leave "W. B. D." to reconcile these declarations of Dr. Broca made in the public meeting with the private declarations made to him. "W. B. D." closes with the remark that "he has not been able to find [in the book] a single shred of proof of the recent origin of man."

I show that the lake-dwellings in France come down to the eighth century of our era; in Pomerania and Sweden to the eleventh century. I show that great changes of level have occurred in different parts of the earth within a comparatively recent period, as at Uddenalla and Södutalje in Sweden, and in the island of Möen.

I show that in America the remains of the mastodon and mammoth occur in the most superficial deposits—the food sometimes preserved in the stomach; I refer to the preservation of the Mammoth in Siberia; I show that the reindeer and Great Irish Elk lived in Europe down to the Middle Ages; that the

Cave-bear survived to Neolithic times, &c. I show that the hippopotamus is figured in the Trojan bed at Hissarlik; that the lion was found in Europe three centuries before our era; that the rhinoceros is found in the neolithic caverns of Gibraltar; that the elephant was brought to Shalmaneser II. by the *Mauri* in the eighth century B.C. I might have added that the elephant lived in Mauritania (near the Straits of Gibraltar) in the time of Herodotus and Pliny.

I point out that, owing to the continuance of the ice-sheet, palaeolithic man never penetrated into Scotland or Denmark; but that the human period there commences with the Neolithic age, which, interpreted, means that the *Glacial epoch* in that region lasted down to the date of the older lake-dwellings.¹

JAMES C. SOUTHALL

Richmond, Virginia, U.S., March 20

"The Unseen Universe"

IN Art. 213 the distinguished authors of "The Unseen Universe" say: "We have already shown (Art. 164) that development without life, that is dead development, does not tend to produce uniformity of structure in the products which it gives rise to."

In the article referred to they say: "There is one peculiarity of the process of development now described which we beg our readers to note. We have supposed the visible universe, after its production, to have been left to its own laws, that is to say, to certain inorganic agencies, which we call forces, in virtue of which its development took place. At the very first there may have been only one kind of primordial atom; or, to use another expression, perfect simplicity of material.

"As, however, the various atoms approached each other in virtue of the forces with which they were endowed, other and more complicated structures took the place of the perfectly simple primordial stuff. Various molecules were produced at various temperatures, and these ultimately came together to produce globes or worlds, some of them comparatively small, others very large. Thus the progress is from the regular to the irregular." Is not this a *non sequitur*? "And we find a similar progress when we consider the inorganic development of our own world. The action of water rounds pebbles, but it rounds them irregularly; it produces soil, but the soil is irregular in the size of its grains, and variable in constitution. Wherever what may be termed the brute forces of nature are left to themselves, this is always the result; not so, however, where organisms are concerned in the development.

"Two living things in the same family are more like each other than two grains of sand or two particles of soil. The eggs of birds of the same family, the similar feathers of similar birds, the ants from the same ant-hill, have all a very strong likeness to each other." It seems to me that the argument here tends to show that the planetary or world development, and what the authors term living development, are based on the same primordial law. If development without life does not tend to produce uniformity of structure in the products it gives rise to, and development with life does tend to the opposite result it would logically follow that the worlds with which we are acquainted are the result of living development.

No two living things of the same family are more alike than are the planets of our solar system; alike in form, alike in their motions, and alike in the material of which they are made; and if the doctrine of their growth, maturity, and final dissolution, which the nebular hypothesis ascribes to them, be a verity, then alike in these respects to living development on the earth. I have long been of the opinion that the same principle underlies all development from the smallest microscopic insect to the largest world in the universe, and I am gratified to find two such profound philosophers as Professors Stewart and Tait virtually advancing the same theory. It may, however, be said that they do not admit this sequence. They suppose the visible universe, after its production, to have been left to its own laws, to certain inorganic agencies or forces in virtue of which its developments took place, that at first there may have been only one kind of primordial atom from which all present development has arisen. This is mere speculation; but admitting its verity, it does not alter the truths enunciated by them that dead development does not tend to produce similarity of structure, that the results of the brute forces of nature left to themselves are accidental forms, and that where there is uniformity of structure there is living development.

¹ Certainly not 10,000 years ago; in my opinion not 3,500.